

**HEALTH RISK ASSESSMENT  
OF METALS IN SOILS  
AT THREE RCRA UNITS:  
BURN AREA, BURN CAGE, PANS  
AND RAILS AREA, AND  
EAST FORK AREA**

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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of California.



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9-29-89

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## **I. EXECUTIVE SUMMARY**

The Bermite Division, Whittaker Corporation is located within the city of Santa Clarita, California. Bermite was formally an ordnance manufacturing facility. The site is remotely located and consists of approximately 950 acres of undeveloped land. Local topographic relief varies up to 500 feet. The site is unpopulated and undeveloped.

The manufacturing facility was closed on April 3, 1987. A Resource, Conservation and Recovery Act (RCRA) Closure Plan for fourteen RCRA units was approved and the site is currently completing the closure process. Twelve (12) of the RCRA units have been certified as clean closed. Three (3) of those twelve, the Burn Area; Burn Cage, Pans and Rails Area; and the East Fork Area were used for burning of explosive materials from the manufacturing operations.

In the process of closure of these three units, soil sampling for metals was performed. Two (2) to four (4) metals per unit were detected at concentrations in the soils at average concentrations considered above facility background average soil concentrations. As a result, this Health Risk Assessment was performed to determine the health risk associated with exposure to these soils.

The environmental fate of the metals has been reviewed and it is shown that the four metals are immobile and strongly adsorb to the soils. In addition, these metals are not readily bioaccumulated.

The concentration of the metals in the soils at these RCRA units do not present a hazard and are not toxic under the potential exposure to the soils. The concentrations are orders of magnitudes less than applicable standards set by the California Health and Safety Code and by the Occupational Health and Safety Agency.

The soils at the three RCRA units have been analyzed by a definitive bio-assay in accordance with California Administrative Code, Title 22. These tests conclude that the soils are not toxic or hazardous.

The metals present at the three RCRA units: Burn Area; Burn Cage, Pans and Rail Area; and East Fork Area are not present at concentrations that pose a risk to human health or the environment.

## **II. INTRODUCTION**

### **A. Purpose**

The purpose of this Health Risk Assessment report is to summarize the known environmental fate and toxicological data on the metal elements that have been identified at low but statistically significant concentrations in the near surface soils at the RCRA units: Burn Area (BA); Burn Cage, Pans and Rails Area (BCPR); and East Fork Area (EFA) and to evaluate the health risk potential of these metals. Background information on the RCRA units, past closure activities and existing concentrations of the metals in the soils at the RCRA units is given below in Section B.

The environmental fate constants and the known toxicological characteristics of the specific metals are discussed in Sections III and IV. Soil samples from the in-situ soils at the RCRA units have been analyzed by a 96-hour static bio-assay test and these results are presented in Section V.

Potential pathways of exposure to the metals present at the three RCRA units discussed in Section VI and in Section VII conclusions are made as to the health risks associated with the metals.

### **B. Background**

The Bermite Division of Whittaker Corporation discontinued operations effective April 3, 1987. The Bermite facility at the time of closure had 14 Resource Conservation and Recovery Act (RCRA) units with interim status permits for operation of these units. The location of the Bermite facility and the three areas evaluated for this report are

shown on Figure 1. The facility is located on 950 acres of nonpopulated land in the hills above the towns of Saugus and Newhall, California which are now part of Santa Clarita, California. The three RCRA units are remotely located on the property in the bottom of two steeply sloping valleys.

Two former burn pits in close proximity to each other and in aggregate forming the BA historically were used to burn contaminated paper and gloves. The BA was protected by berms on two sides and a natural hill slope on the third for the safety of operating personnel. Wastes were loaded into the BA and remotely ignited.

In the BCPR, the burn cage was an expanded metal cage which was used to burn contaminated paper and gloves collected from the manufacturing operations at the end of each work shift. Three steel pans were used for burning wastes containing off spec flare mix, rocket propellant and BP-1 powder. Four steel rails were used to burn off spec flare pellets and powders. The wastes were carefully placed in each of the three types of burn vessels (cage, pans and rails) and were ignited.

The EFA was used to detonate waste off-spec explosive components.

In April 1987 these three RCRA units were dismantled, and preliminary soil sampling at the RCRA units was performed. The pits were backfilled and the cage, pans and rails were decontaminated and sold to a scrap metal dealer. At present, the location of the former RCRA units cannot be distinguished from the surrounding property. A topographic map of each area indicating the RCRA unit boundaries and soil sampling locations of the preliminary sampling and additional sampling (as discussed below) are presented on Figures 2, 3 and 4 corresponding to the BA, BCPR and EFA, respectively.

In April 1987, a Revised RCRA Closure Plan was submitted to the California Department of Health Services (DHS) and to the U.S. Environmental Protection Agency (EPA) Region IX for approval. The Closure Plan, with modifications, was approved by the DHS and EPA by letter dated December 28, 1987. As required by the Closure Plan, the three RCRA units were again sampled to verify the absence of hazardous constituents. Prior to the final Closure Plan modifications, the soil sampling and analysis plan for all of the RCRA units at Bermite was approved by the DHS and EPA.

The sampling of the soils was performed in December of 1987. Sampling results were submitted to DHS and EPA in the report "Verification Sampling at Selected RCRA Units", March 1988. The metal concentrations detected in the soils at the BA, BCPR and EFA are presented again herein in Table 1. Table 1 lists the median concentration and range of concentrations for each metal at each area. This information is compiled from the complete sampling and analysis results of each area which are included as Appendix A. These three RCRA units are three of twelve RCRA units that have been certified as "clean" closed. The certifications are on file at the DHS and EPA. The certifications were submitted to DHS and EPA on March 8, 1989, May 10, 1989 and June 16, 1989 for the BA, BCPR and EFA.

The results of background sampling for metal concentrations at the Bermite facility and commonly found background median and range concentrations are also presented in Table 1.

As was shown in the March 1988 report, certain metals from each of the three areas were present at average concentrations above the facility background average for those metals. The specific metals are indicated by an asterisk (\*) in Table 1, and are:



barium, cadmium and lead at the BA; barium, cadmium, copper and lead at the BCPA; and cadmium and lead at the EFA.

As a result of the concentrations of the four metals at the three areas, the DHS requested that Bermite perform a health risk assessment of these metals in the soils. In order to provide a more complete analysis of the potential risk, resulting from exposure to these soils, further soil sampling and analysis at the three areas was performed in July 1989. The purpose of the sampling was to assess the hazardous nature of the soils containing the metal elements by performing a bio-assay analysis of representative soils. Three soil samples were collected from each of the three areas. The samples were collected from those borings and depths from the December 1987 sampling and analysis that exhibited the highest concentrations of the metals.

The new soil borings were advanced immediately adjacent to the original December 1987 borings. Split-spoon soil samples were collected in the same manner as during the December 1987 sampling. The nine soil samples were analyzed for the same metals as were analyzed in December 1987, for pH and in addition, each sample was analyzed by a 96-hour definitive bio-assay. The results of the analysis of these nine soil samples including the metal concentrations, pH, and bio-assay results are presented in Table 2. The pH and metal results of the samples from the December 1987 sampling which correspond to the same depth and adjacent boring as the July 1989 samples are included in Table 2 for comparison purposes.

Review of Tables 1 and 2 indicates that the metal concentrations detected in July 1989 are within the range of concentrations determined in December 1987. The pH values for all nine samples from July 1989 are, with the exception of one sample, slightly less than [and nearer to a neutral pH (pH=7)] the December 1987 samples.

### III. ENVIRONMENTAL FATE

The environmental hazard associated with the inorganic metal elements present in the soils at the three areas can be expressed in terms of their environmental fate and toxicity.

Environmental fate is the transport or chemical processes which would describe the behavior of a given element in the environment. Elements present in the soils can migrate through the soil to groundwater, be strongly adsorbed to the soil or be bioaccumulation by plants. There is not a satisfactory way to measure volatility of inorganic constituents, and volatilization is believed to be important for only a very few elements (Bromine, Chlorine, Mercury, Iodine, Nitrogen, and Sulfur), none of which were detected in any of the three RCRA areas.

Water is the primary means by which contaminants can be transported through the soils. The main properties of inorganic constituents that affect their migration in soils includes their water solubility and their strength of adsorption. The potential for the elements to migrate will also depend on the adsorptive capacity of the soil and the kinetics of the soil water movement.

The extent to which an element or compound partitions itself between soil and interstitial water is described by a chemical-specific adsorption constant  $K_{oc}$ .  $K_{oc}$  is largely independent of the soil properties. Lyman et al. (1982) provides several methods for estimating  $K_{oc}$  from known properties of the chemical. A high value of  $K_{oc}$  (>100) indicates tight bonding of a chemical to the soil. A low  $K_{oc}$  (<100) value usually implies high mobility of the element.

The octanol/water partition coefficient ( $K_{ow}$ ) is an important parameter in studies of the environmental fate of contaminants, since it represents the tendency of the chemical to partition itself between an organic phase (e.g. soil) and an aqueous phase. The octanol/water partition coefficient is defined as the ratio of a chemical's concentration in the octanol phase to its concentration in the aqueous phase of a two-phase octanol/water system. Chemicals with low  $K_{ow}$  values (e.g. <10) are considered hydrophilic, and chemicals with high  $K_{ow}$  values (e.g. >10) are considered hydrophobic.

The bioconcentration factor (BCF) indicates the degree to which a chemical may accumulate in organisms. It is defined as:

$$BCF = \frac{\text{Concentration of chemical at equilibrium in organism}}{\text{Mean concentration of chemical in soil}}$$

Substances with bioconcentration factors less than  $10^4$  are considered to have low bioaccumulation potential.

The  $K_{oc}$ ,  $K_{ow}$  and BCF for each of the statistically significant metal elements are discussed below and are presented in Table 3.

#### A. Barium

Barium is a naturally occurring element; it is present in substantial quantities in mineral deposits of baryte ( $BaSO_4$ ) found in the local area.

Barium is slightly soluble in water (Cotton and Wilkinson, 1980), although no values are available in the literature. The bioconcentration factor for barium is 400 (Bowen,

1979). The octanol/water partition coefficient,  $K_{ow}$  and the adsorption constant,  $K_{oc}$  for barium are then:

$$\begin{aligned}\text{Log } K_{ow} &= 1.32 \text{ Log BCF} + 0.30 = 1.32 \text{ Log } 400 + 0.30 = 3.79 \\ K_{ow} &= 5500\end{aligned}$$

$$\begin{aligned}\text{Log } K_{oc} &= \text{Log } K_{ow} - 0.21 = 3.79 - 0.21 = 3.58 \\ K_{oc} &= 5000\end{aligned}$$

Barium is therefore hydrophobic and immobile. Barium has a low bioconcentration potential, hence it will not readily be bioaccumulated.

#### B. Cadmium

Cadmium has relatively low abundance in nature, but even though cadmium minerals are scarce, as a result of its chemical similarity to zinc, cadmium occurs in almost all zinc ores. Cadmium is extensively used in electroplating, paint, pigment and the plastics manufacturing industry (U.S. EPA, 1980).

Cadmium is insoluble in water (Merck, 1976). Cadmium's bioconcentration factor is 81 (U.S. EPA, 1986). Its octanol/water partition coefficient and adsorption constant are:

$$\begin{aligned}\text{Log } K_{ow} &= 1.32 \text{ Log BCF} + 0.30 = 1.32 \text{ Log } 81 + 0.30 = 2.82 \\ K_{ow} &= 661\end{aligned}$$

$$\begin{aligned}\text{Log } K_{oc} &= \text{Log } K_{ow} - 0.21 = 2.82 - 0.21 = 2.61 \\ K_{oc} &= 407\end{aligned}$$

Cadmium is strongly adsorbed to the soils and the sorption processes are increasingly effective as pH increases (US EPA 1980). Cadmium is therefore hydrophobic and is not readily bioaccumulated.

### C. Copper

Copper is widely distributed in nature as metal, and also in sulfides, arsenides, chlorides, and carbonates (Cotton and Wilkinson, 1980).

Copper is insoluble in water (Weast, 1983). The bioconcentration factor for copper is 200 (U.S. EPA, 1986). The octanol/water partition coefficient,  $K_{ow}$  and the adsorption constant,  $K_{oc}$  for copper are then:

$$\text{Log } K_{oc} = \text{Log } K_{ow} - 0.21 = 3.34 - 0.21 = 3.13$$

$$K_{oc} = 1.35 \times 10^3$$

Copper is therefore hydrophobic, it is strongly bound by the soils and is not readily bioaccumulated.

### D. Lead

Lead is a naturally occurring element and is a major constituent of more than 200 identified minerals (US EPA, 1979). Lead concentrations in soils have been elevated globally by emissions from car exhausts, resulting in environmental concentrations of lead ranging from 2 to 300 mg/kg (Bowen, 1979).

Lead is insoluble in water (Merck. 1976). Its bioconcentration factor is 49 (US EPA, 1986). The octanol/water partition coefficient and the adsorption constant for lead are:

$$\begin{aligned}\text{Log } K_{ow} &= 1.32 \text{ Log BCF} + 0.30 = 1.32 \text{ Log } 49 + 0.30 = 2.23 \\ K_{ow} &= 170\end{aligned}$$

$$\begin{aligned}\text{Log } K_{oc} &= \text{Log } K_{ow} - 0.21 = 2.23 - 0.21 = 2.02 \\ K_{oc} &= 105\end{aligned}$$

Lead is not readily bioaccumulated. It is hydrophobic and will be strongly adsorbed to the soils. Huang et al. (1977) studied the adsorption of lead to soils. They observed that adsorptions in pH-dependent, and above pH 7, lead is strongly adsorbed to all soils.

#### IV. TOXICITY

Toxicity is defined as the ability of a chemical to cause injury once it reaches a susceptible site in or on the body. Toxicology is the subject concerned with the study of the toxic effects of chemical substances on living systems. Table 4 presents known toxicological data on the four metals detected at the three RCRA units. Included in Table 4 are applicable standards for concentrations of the metals in soils and in ambient air.

##### A. Barium

Water and acid soluble barium compounds can be toxic. The symptoms of barium poisoning include respiratory and gastrointestinal irritation, muscle spasms, slow pulse, hypokalemia, irritated eyes, and skin burns (NIOSH, 1985). The total threshold limit value (TTLV) for barium is 10,000 mg/kg and therefore the soils containing the barium are not a bioaccumulative toxic substance (California Title 23, Health and Safety Code, Article 11, page 1800.77). The Occupational Safety and Health Agency (OSHA) time waited average (TWA) value for barium compounds is 0.5 mg/m<sup>3</sup>. At the highest average concentration of barium in the soils, (131 mg/kg) and at the nuisance dust level promulgated by OSHA of 10 mg/m<sup>3</sup>, the highest concentration of barium in the ambient air at the facility that can be expected under reasonable conditions is 0.0013 mg/m<sup>3</sup>, approximately two orders of magnitude less than the TWA.

##### B. Cadmium

Cadmium and its salts can be toxic. Ingestion of cadmium causes increased salivation, choking, vomiting, abdominal pain, anemia, renal dysfunction, diarrhea, and tenesmus. After ingestion, the amount of cadmium retained in the body is estimated to be

between 3 and 8 percent (Friberg et al., 1974). Inhalation of cadmium dust or fumes causes throat dryness, cough, headache, vomiting, chest pains, extreme restlessness and irritability, pneumonitis, and possibly broncho-pneumonia. Cadmium has also been listed as a carcinogen by the EPA (Merck, 1976).

The TTLC for cadmium is 100 mg/kg and therefore the soils containing cadmium are not a bioaccumulative toxic substance. The TWA for cadmium is 0.05 mg/m<sup>3</sup>. At the highest average concentration of cadmium in the soils (3.4 mg/kg), a reasonable concentration of cadmium in ambient air at the facility is  $3.4 \times 10^{-5}$  mg/m<sup>3</sup> which is approximately three (3) orders of magnitude less than the TWA.

#### C. Copper

Elemental copper has high oral toxicity (Sax, 1984). The symptoms of copper poisoning include irritated mucous membranes and pharynx, nasal perforation, eye irritation, metal taste, and dermatitis. The TTLC for copper is 2500 mg/kg and therefore the soils containing copper are not a bioaccumulative toxic substance. The TWA for copper is 1 mg/m<sup>3</sup>. At the highest average concentration of copper in the soils (20 mg/kg), a reasonable concentration of copper in ambient air at the facility is  $2 \times 10^{-4}$  mg/m<sup>3</sup> which is over three (3) orders of magnitude less than the TWA.

#### D. Lead

Lead can be toxic and can accumulate in the tissues of man and animals. The major toxic effects of lead intoxication include anemia, neurological dysfunction, and renal impairment. Chronic effects include weight loss and weakness (US EPA, 1976). The TTLC for lead is 1000 mg/kg and therefore the soils containing lead are not a bioaccumulative toxic waste. The TWA for lead is 0.15 mg/m<sup>3</sup>. At the highest average



concentration of lead in the soils (22 mg/kg), a reasonable concentration of lead in ambient air at the facility is  $2.2 \times 10^{-4}$  which is over two (2) orders of magnitude less than the TWA.

## **V. BIO-ASSAY ANALYSIS OF THE ON-SITE SOILS**

A useful method in toxicological screening of a chemical or matrix of interest is acute toxicity testing. Acute toxicity is defined as the severe effects suffered by organisms from short-term exposure to certain chemicals. The endpoint measurement of the acute toxicity studies in the aquatic biota is the death or immobilization of the test organism. The purpose of acute toxicity screening is to determine whether the chemical being tested is biologically active with the respect to the endpoint being measured. Whereas toxicological evaluation considers one chemical at a time, a bio-assay analysis is a demonstration of the toxicity of the entire set of compounds in the matrix.

Three representative soil samples were collected at each of the RCRA units and used in the acute toxicity test. Samples were obtained at depths of 2.5 to 8 feet below the ground surface. The exact sampling locations are presented in Figures 2, 3 and 4. The aquatic toxicity screening as defined by the California Administrative Code, Title 22 was performed by the FGL Environmental Laboratory, Santa Paula, California. The original analytical reports of the bio-assay analysis are included in Appendix C.

The aquatic species used in this 96-hour test was fathead minnow or *Pimephales promelas*. The fathead minnow was chosen because it is within a range of sensitivities to the chemicals being tested, a large toxicological data base exists for this species, and it is easily maintainable in the laboratory. Various methods have been developed for exposing aquatic organisms to the chemicals in the laboratory. The toxicant delivery system employed in this test was a static delivery system. Static delivery systems consist of exposure vessels in which the test organisms are subjected to the same chemical solution for the duration of the test. Multiple vessels, each with a different concentration of the sample, are used for each sample. The solutions are not changed

or renewed and are monitored throughout the test. The percent survival of all nine of the undiluted test vessels in this screening was 90-100. Because of the high survival rate, the 96-hr  $LC_{50}$  for this bio-assay is greater than 500 mg/l.  $LC_{50}$  is the median lethal concentration, which represents the estimated concentration of the test material that will kill or immobilize 50 percent of the test organisms in a predetermined length of time. The 50 percent effect level is used because it is the most reproducible response and can be estimated with the highest confidence. The  $LC_{50}$  is usually expressed in terms of the duration of the test, i.e. 96-hr  $LC_{50}$ . As specified in the California Administrative Code, Title 22, a matrix with  $LC_{50}$  greater than 500 mg/l is nontoxic and nonhazardous.

There was some mortality of the test organisms in some of the test vessels although the mortality was never greater than 30%. The highest mortality actually occurred in the control test vessel. This high mortality is most likely the result of the poor acclimatization environment that the test organisms experienced. An explanation of the poor acclimatization has been provided by FGL and is included in Appendix C.

## **VI. EXPOSURE PATHWAYS**

### **A. Introduction**

In evaluating exposure, it is necessary to identify both the exposure route and the exposure media, which are the two components of an exposure pathway. The possible pathways of exposure to the metals at the RCRA units are schematically presented in Figure 5. The three routes of the possible human exposure to the metals are inhalation, ingestion, and dermal contact of soils, ground and surface water and plants.

### **B. Biosphere**

An indirect exposure pathway might involve contaminant bioaccumulation by plants with subsequent human consumption. However, all four metals present at the site have low bioconcentration factors, hence they will not readily be bioaccumulated.

### **C. Groundwater**

As was presented in III above, all the four metals are strongly adsorbed to the soil and/or are relatively immobile. Groundwater at the Bermite facility has been shown to be at a depth up to 700 feet below the ground surface. It can be then assumed that groundwater contamination by these metals at the site is not possible.

### **D. Soil**

Under present use conditions, contact with the soils at the three former RCRA units will be limited to the few personnel involved with the RCRA closure activities at the

Bermite facility. No further activities are scheduled for these three former RCRA units so there should be no contact with the soils.

The construction activities during development of the property may lead to increased suspension of dusts and/or increased exposure of the soils for potential ingestion or skin contact. It has been shown above, however, that the soils containing the metals are not toxic or hazardous either in place or suspended as a dust.

E. Air

Erosion of the soils by wind and or rainfall runoff will occur to some degree. The three former RCRA units are located in remote areas of the Bermite facility; there is little chance of inhalation of airborne dusts. As discussed above, suspended dusts will not create concentrations of the metals above the TWA for the metals.

## **VII. SUMMARY AND CONCLUSIONS**

The purpose of this Health Risk Assessment was to summarize the known concentrations and environmental fate and toxicological data on the metals detected at statistically significant concentrations at the three RCRA units: Burn Area; Burn Cage, Pans and Rails Area; and East Fork Area. It has been shown that the metal elements barium, cadmium, copper and lead are strongly adsorbed to the soils, and/or are immobile. There is little or no potential for groundwater contamination by these compounds. In addition, the four metals are relatively insoluble in water.

The four metal compounds, while they can be toxic and a threat to human health or the environment at certain concentrations, are not present at concentrations that are significant. The maximum detectable concentrations of the metal elements in the soils are orders of magnitudes below applicable standards for protection of human health and the environment and are within acceptable ranges found in soils throughout the environment.

The soils were analyzed in accordance with the California Administrative Code, Title 22. This bio-assay analysis is a demonstration of the toxicity of the soils. The percent survival was 90-100. Therefore, the soils at these three former RCRA units are neither toxic nor hazardous.

The primary human exposure pathways to the four metals at these units are via ingestion, inhalation or skin contact with the soils. Under all the exposure conditions, however, the concentrations of the four metals are far below the concentrations considered to be a threat to human health or the environment. As shown in Table 4, the maximum concentrations of the metal compounds are orders of magnitude less than

the threshold limit concentrations set by the Title 22 California Health and Safety Code.

In addition, it was shown in section V above that the soils from the three former RCRA units are not considered hazardous or toxic based on the definitive bio-assay analysis.

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## **TABLES**

**TABLE 1**

**MEDIANS AND RANGES OF METAL CONCENTRATIONS IN SOILS IN mg/kg**  
**Bermite Division - Whittaker Corporation**

X	Median Soil Concentration (Range)				
	12/89 Soil Sampling				
	BA	BCPR	EFA	Background <sup>1</sup>	Facility Background
Arsenic	2.9 (<2.5)	4.9 (<3-9)	4.9 (<3-10)	6 (0.2-40)	4.6 (<3.0-6.0)
Barium	131* (<5-2250)	91* (<50-620)	51 (<50-78)	500 (100-3000)	52 (<50-76)
Cadmium	1.0* (<0.5-12.7)	0.8* (<0.5-6)	3.4* (<0.5-8)	0.35 (0.01-2)	0.5 <0.5
Chromium	29 (<5-666)	<50 -	<50 -	70 (5-1500)	50 <50
Copper	- -	20* (<10-82)	- -	30 (2-250)	11 <10-23)
Lead	22* (<5-263)	18* (4-82)	10.9* (<4-110)	35 (2-300)	3.7 (<3.0-12.0)
Mercury	<0.2 -	<0.1 -	<0.1 -	0.06 (0.01-0.5)	<0.10 <0.10
Selenium	<1 -	<0.5 -	<0.5 -	0.4 (0.01-1.2)	<0.50 <0.5
Silver	2.5 (0.4-7.4)	<3 -	<3 -	0.05 (0.01-8)	3.0 <3.0

**NOTE:**

BA = Burn Area

BCPR = Burn Cage, Pans and Rails Area

EFA = East Fork Area

1 Adapted from Bowen, 1979

\* Concentrations present statistically significant above background

**TABLE 2**

pH, Metal and Bio-Assay Results  
Soil Samples from Burn Area; Burn Case Pans and Rails Area; East Fork Area  
July 1989 Sampling

Bermite Division - Whittaker Corporation

<u>Sample Identification</u>	<u>Concentration (mg/kg)</u>					
	<u>Arsenic</u>	<u>Barium</u>	<u>Cadmium</u>	<u>Chromium</u>	<u>Copper</u>	<u>Lead</u>
<b>(Burn Area)</b>						
BA-4132-8	2 (<2.0)	40 (256)	<2 (<2.0)	10 (6.9)	-- --	5 (8.7)
BA-6125-7	<2 (<2.0)	300 (2250)	<2 (<2)	13 (666)	-- --	6 (<5.0)
BA-6833-8	<2 (<2.0)	40 (158)	<2 (2.3)	10 (38)	-- --	5 (50)
<b>(Burn Cage, Pans &amp; Rails Area)</b>						
BCPR-3219-4	-- (7)	121 (100)	<2 (1.2)	16 (<50)	95 (82)	58 (62)
BCPR-5729-4	2 (5)	97 (500)	<2 (1)	11 (<50)	47 (42)	18 (110)
BCPR-11038-4	<2 (8)	170 (620)	0.5 (1.4)	23 (<50)	23 (28)	19 (82)
<b>(East Fork Area)</b>						
EFA-2220-5	2 (4)	64 (<50)	11 (72)	15 (<50)	-- (<10)	7 (6)
EFA-3709-9	2 (10)	58 (78)	<2 (<0.5)	13 (<50)	-- (<10)	6 (8)
EFA-6633-5	<2 (5)	56 (<50)	<2 (<0.5)	16 (<50)	-- (<10)	21 (110)

**Notes:**

( ) = 12/87 Data

LC<sub>50</sub> = Hazardous Criteria - Title 22 of California Administrative Code

-- = Analysis not Performed

**TABLE 2 (continued)**

pH, Metal and Bio-Assay Results  
Soil Samples from Burn Area; Burn Case Pans and Rails Area; East Fork Area  
July 1989 Sampling

Bermite Division - Whittaker Corporation

Sample Identification	Concentration mg/kg			pH	Fish LC <sub>50</sub> (mg/l)
	Mercury	Selenium	Silver		
(Burn Area)					
BA-4132-8	<0.2 (<0.2)	<1 (<1.0)	<0.4 (0.43)	7.7 (6.8)	<500 --
BA-6125-7	<0.2 (<0.2)	<1 (<1.0)	<0.4 (<0.4)	7.6 (8.3)	<500 --
BA-6853-8	<0.2 (<0.2)	<1 (<1.0)	<0.4 (0.77)	7.7 (8.1)	<500 --
(Burn Cage, Pans & Rails Area)					
BCPR-3219-4	<0.2 (<0.1)	<1 (<0.5)	2 (<3)	7.6 (7.9)	<500 --
BCPR-5729-4	<0.2 (<0.1)	<1 (<0.5)	<0.4 (<3)	7.7 (8.0)	<500 --
BCPR-11038-4	<0.2 (<0.1)	<1 (<0.5)	<0.4 <3	7.8 (8.5)	<500 --
(East Fork Area)					
EFA-2220-5	<0.2 (<0.1)	<1 (<0.5)	<0.4 (<3)	7.6 (8.2)	<500 --
EFA-3709-9	<0.2 (<0.1)	<1 (<0.5)	<0.4 (<3)	7.7 (8.2)	<500 --
EFA-6633-5	<0.2 (<0.1)	<1 (<0.5)	<0.4 (<3)	7.2 (8.6)	<500 --

**Notes:**

( ) = 12/87 Data

LC<sub>50</sub> = Hazardous Criteria - Title 22 of California Administrative Code

-- = Analysis not Performed

**TABLE 3**  
**CHEMICAL AND FATE DATA**

<u>Metal</u>	<u>BCF</u> *	<u>K<sub>ow</sub></u> **	<u>K<sub>oc</sub></u> ***
Barium	400	5500	5000
Cadmium	81	661	407
Copper	200	2190	1350
Lead	49	170	105

Notes:

- \* Bioconcentration Factor (BCF <10<sup>4</sup> indicates low bioaccumulation potential)
- \*\* Octanol/water partition coefficient (chemicals with K<sub>ow</sub> <10 are considered hydrophilic; K<sub>ow</sub> >10 are hydrophobic)
- \*\*\* Adsorption constant (K<sub>oc</sub> <100 implies high mobility; K<sub>oc</sub> >100 implies tight bonding of chemical to soil)

TABLE 4  
TOXICOLOGICAL DATA

Substance	Synonyms	TTLIC	TWA	Routes of Exposure	Toxicity Data	Target Organ(s)	Symptoms/Warning Properties	Hazard Information
Barium	--	10g/kg	0.5 mg/m <sup>3</sup>	Inhalation, Ingestion Contact	--	Heart, CNS, skin, respiratory system, eyes	Upper respiratory irritation; GI; muscle spasm; slow pulse, extrasystoles; hypokalemia; irritated eyes; skin burns.	All water or acid soluble barium compounds are poisonous
Cadmium	--	100 mg/kg	0.05 mg/m <sup>3</sup>	Inhalation, Ingestion	Listed as a carcinogen by the EPA	Respiratory system, kidneys, prostate, blood	Irritation of gastro- intestinal and respiratory tracts	Cadmium and its salts are highly toxic
Chromium	--	2500 mg/kg	1 mg/m <sup>3</sup>	Inhalation, Ingestion,	--	Respiratory system, skin, liver, kidneys	Irritated mucous membranes, pharynx, nasal perforation, eye irritation, metal taste, dermatitis	--
Lead	--	1000 mg/kg	0.15 mg/m <sup>3</sup>	Inhalation, Ingestion, Contact	--	GI tract, CNS, kidneys, blood gingival tissue	Lassitude; insomnia anorexia, low weight, malnutrition; constipation abdominal pain, colic, hypertense anemia; gingival lead line; tremors; wrist paralysis	--

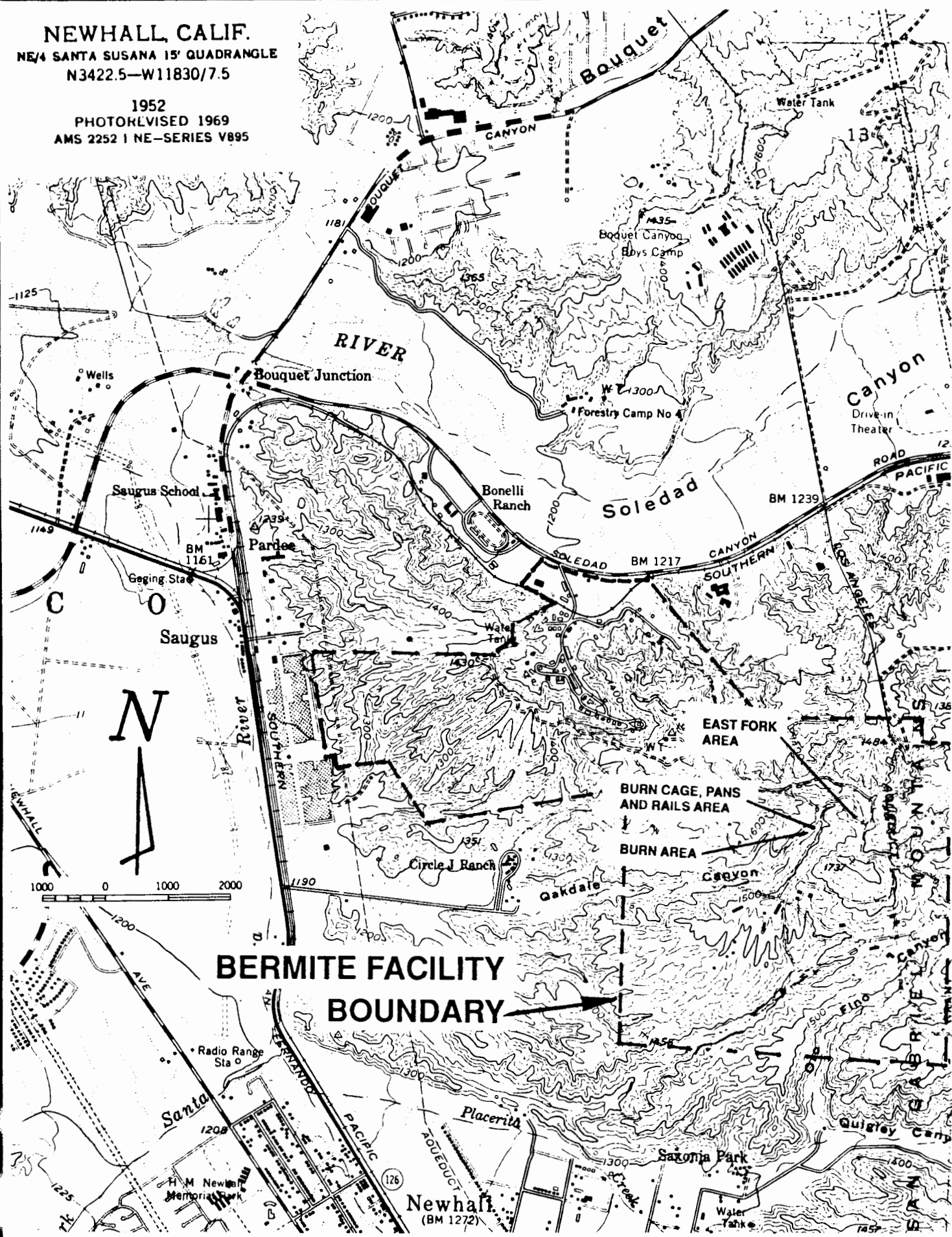
#### REFERENCES AND SOURCES OF INFORMATION

Benschueren, Karel. 1983. Handbook of Environmental Data and Organic Chemicals, 2nd Ed. Van Nostrand Reinhold Co., New York.  
 CGIH, 1985. Threshold Limit Values and Biological Exposure Indices for 1985-86.  
 Merck & Co., Inc., 1983. The Merck Index, 10th Ed.  
 OSHA/NIOSH, 1978. Pocket Guide to Chemical Hazards.  
 29 CFR 1910. Revised March 11, 1983.  
 NFPA, 1984. Fire Protection Guide on Hazardous Materials, 8th Ed.  
 OSHA, 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.  
 California Health and Safety Code, Title 22

## **FIGURES**

NEWHALL, CALIF.  
NE 1/4 SANTA SUSANA 15' QUADRANGLE  
N3422.5-W11830/7.5

1952  
PHOTOREVISED 1969  
AMS 2252 I NE-SERIES V895



BERMITE DIVISION - WHITTAKER CORPORATION

Site Location Map



Wenck Associates, Inc.

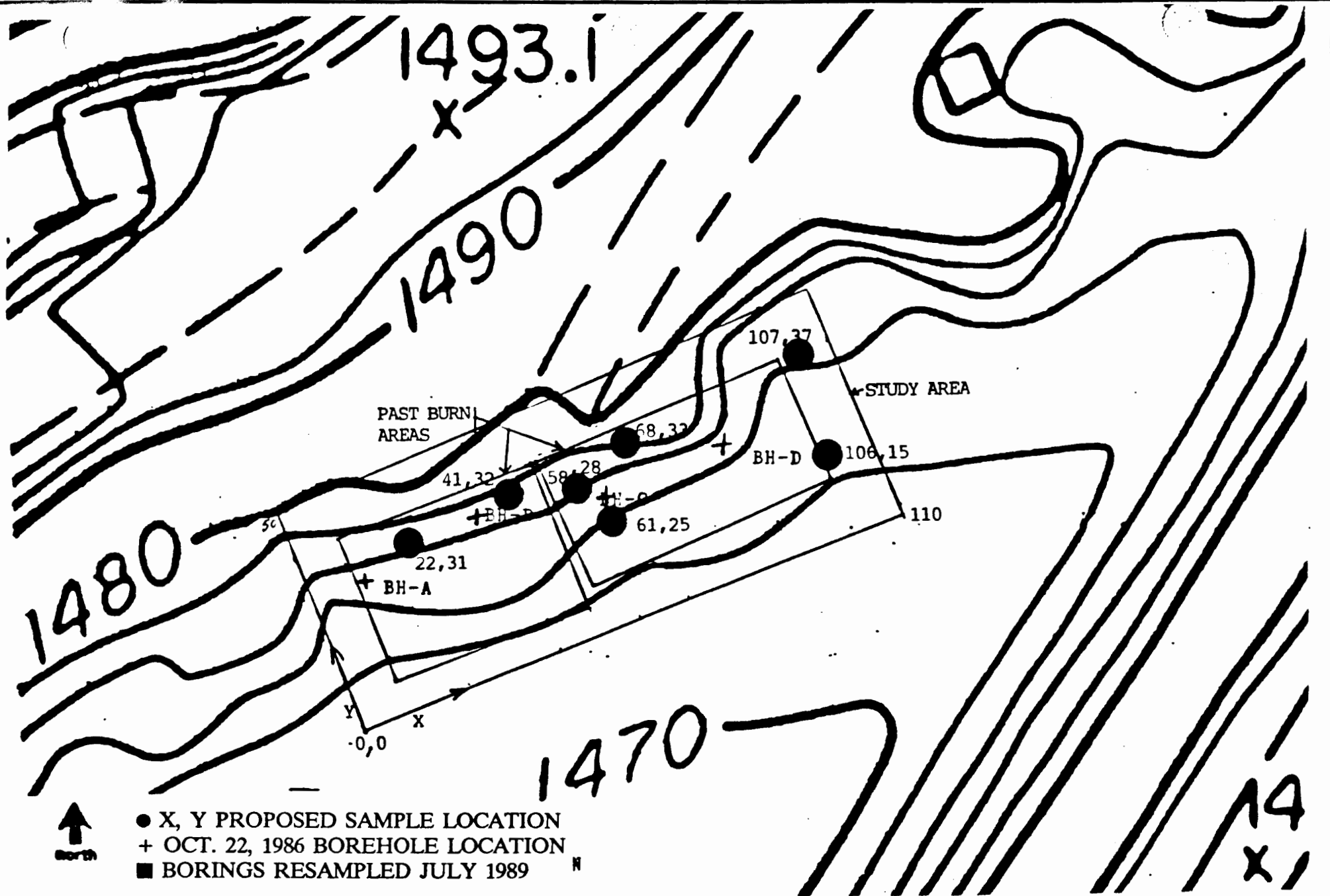
Consulting Engineers

Twelve Oaks Center  
15500 Wayzata Blvd.  
Wayzata, MN 55391

SEP 1989

Fig. 1





BERMITE DIVISION - WHITTAKER CORPORATION

Sampling Location Map - Burn Area



Wenck Associates, Inc.

Consulting Engineers

Twelve Oaks Center  
15500 Wayzata Blvd.  
Wayzata, MN 55391

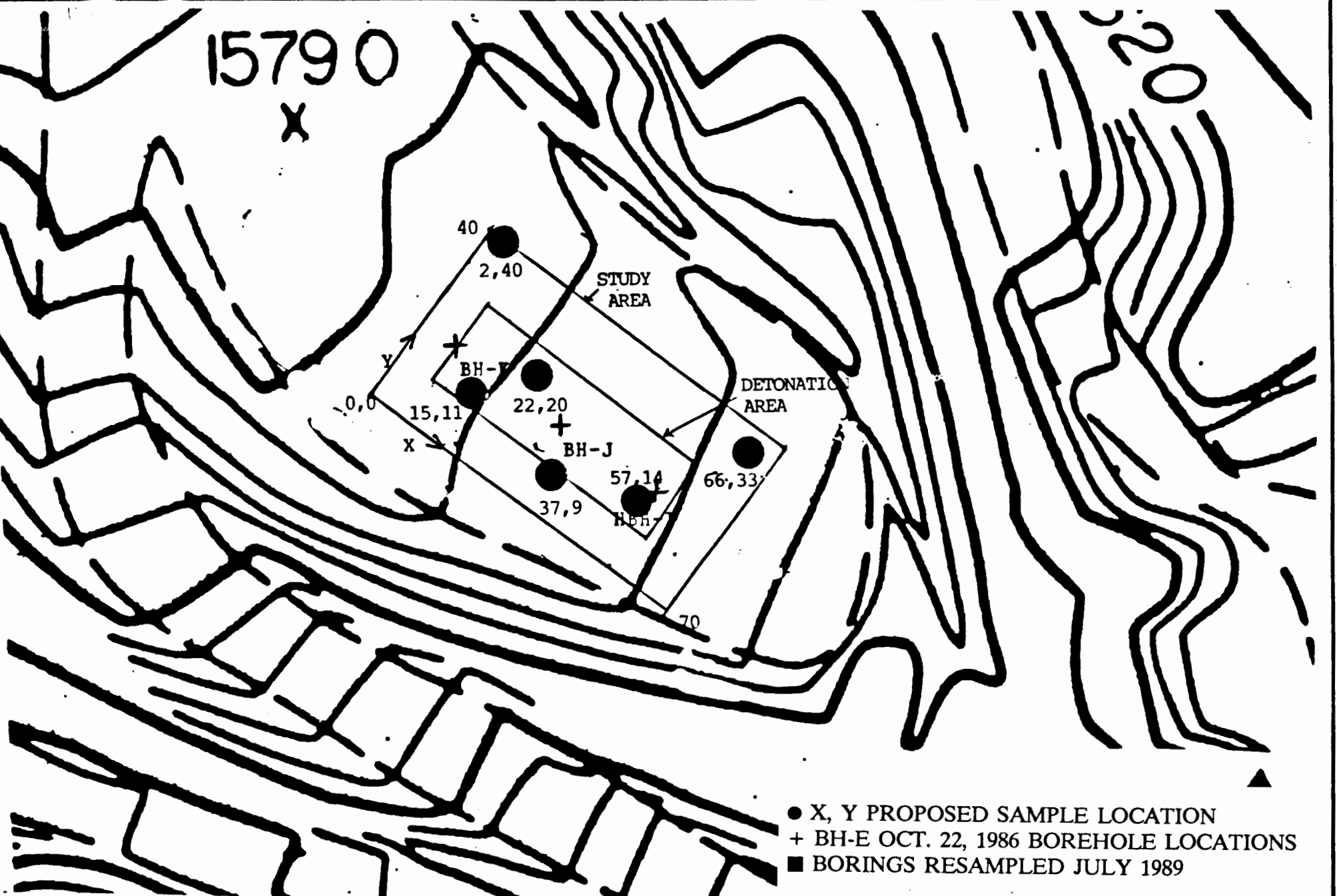
SEP 1989

Fig. 2

15790

X

20



- X, Y PROPOSED SAMPLE LOCATION
- + BH-E OCT. 22, 1986 BOREHOLE LOCATIONS
- BORINGS RESAMPLED JULY 1989

BERMITE DIVISION - WHITTAKER CORPORATION

Sampling Location Map - East Fork Area



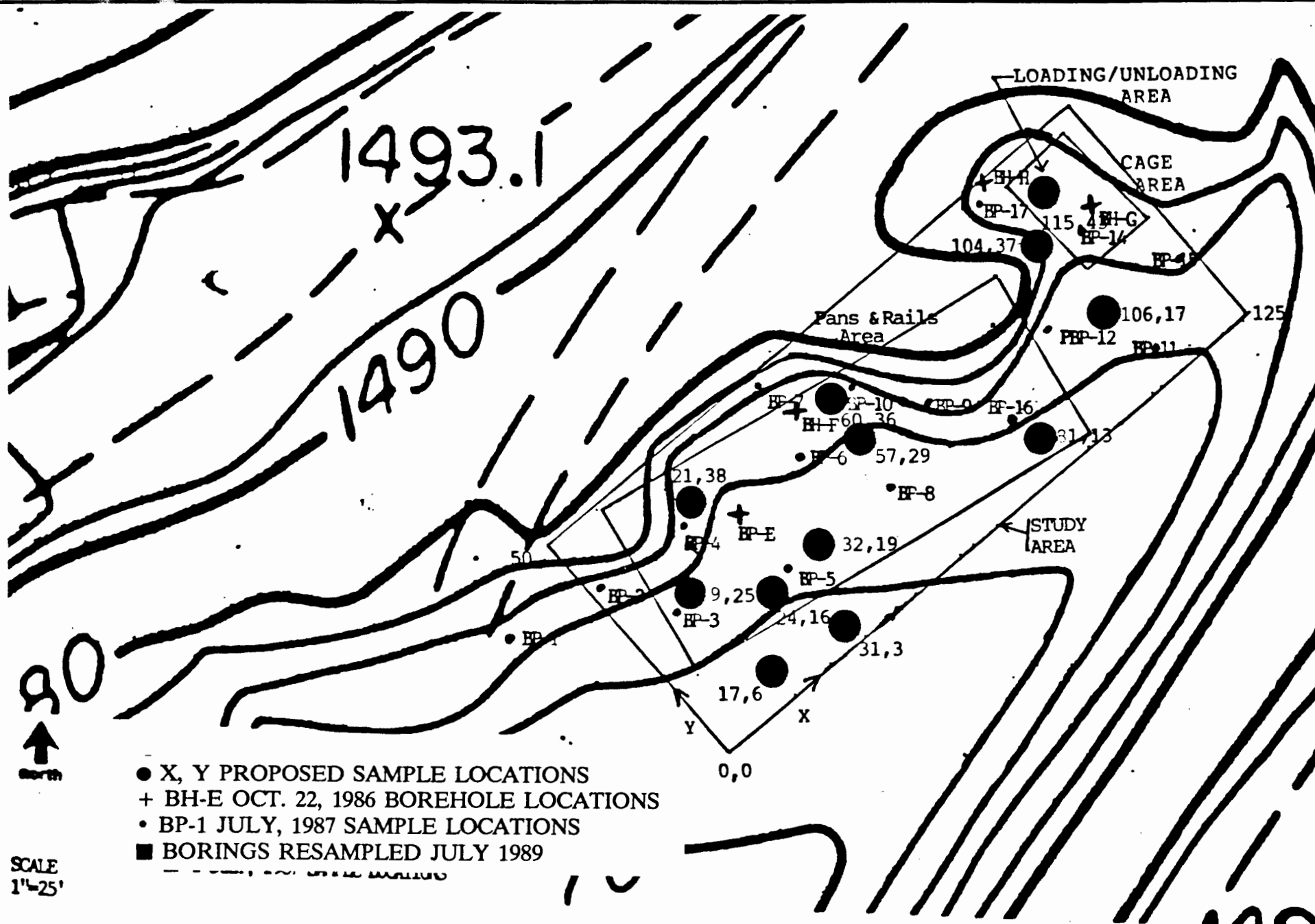
Wenck Associates, Inc.

Consulting Engineers

Twelve Oaks Center  
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Wayzata, MN 55391

SEP 1989

Fig. 4



BERMITE DIVISION - WHITTAKER CORPORATION

Sampling Location Map - Burn Cage, Pans and Rails area



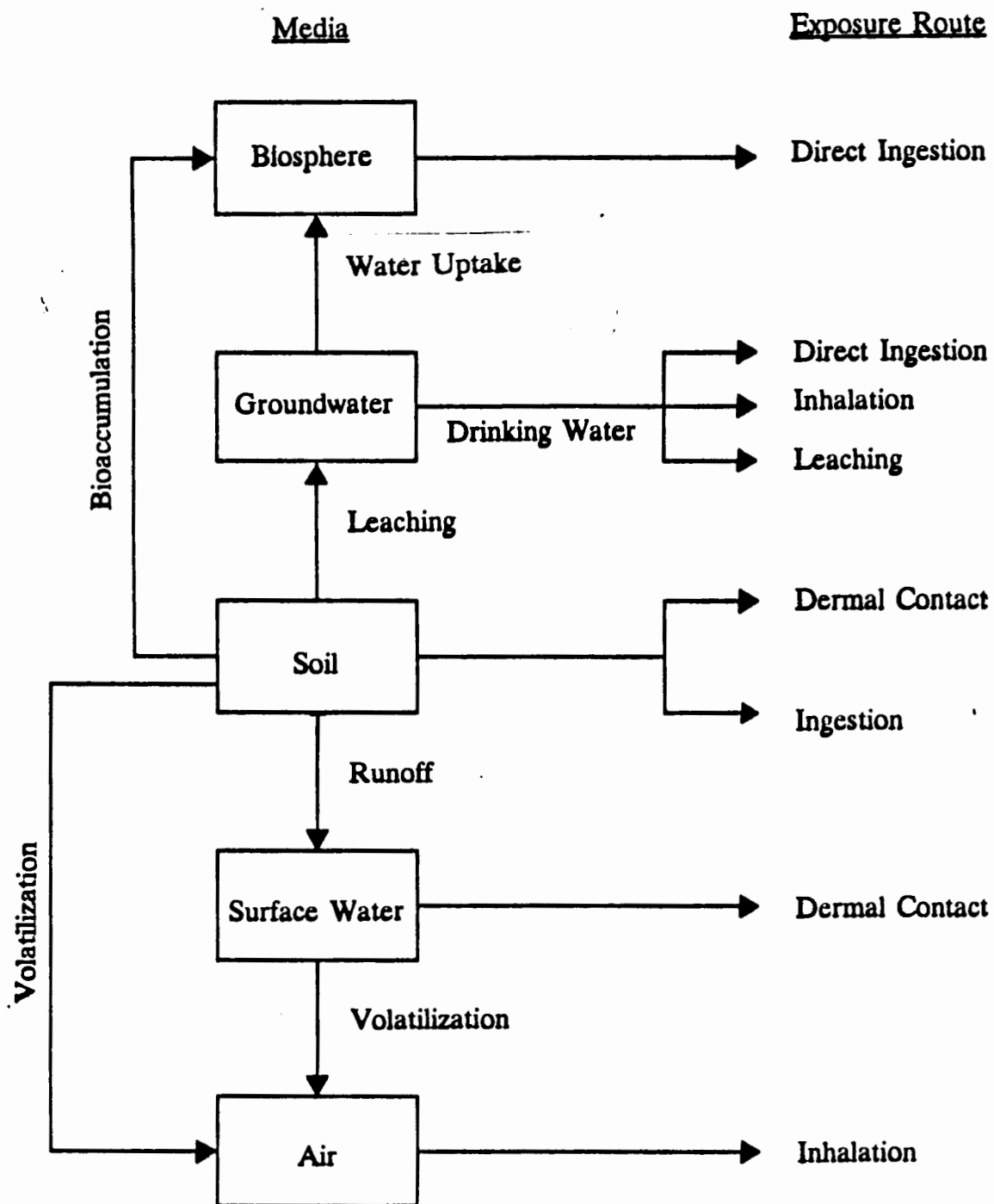
Wenck Associates, Inc.

Consulting Engineers

Twelve Oaks Center  
15500 Wayzata Blvd.  
Wayzata, MN 55391

SEP 1989

Fig. 3



## **APPENDICES**

## **APPENDIX A**

**Sampling and Analytical Results from December 1987**

# FGL ENVIRONMENTAL

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-2

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 9360

Sample Description: EFA 2220-5  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

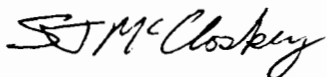
### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTL</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	64	10,000	5
Cadmium	11	100	2
Chromium (Total)	15	2,500	5
Lead	7	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.6	-	-

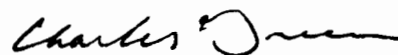
ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

Very truly yours,  
FGL ENVIRONMENTAL



Steve McCloskey, M.S.  
Inorganic Laboratory Manager



Charles Green, Ph.D.  
Laboratory Director

SM/CG:mlh

# FGL ENVIRONMENTAL

---

## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-3

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: EFA 3709-9  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989


### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

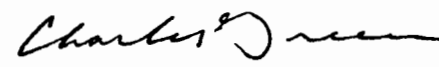
<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTL</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	58	10,000	5
Cadmium	ND	100	2
Chromium (Total)	13	2,500	5
Lead	6	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.7	-	-

ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

Very truly yours,  
FGL ENVIRONMENTAL

  
Steve McCloskey, M.S.  
Inorganic Laboratory Manager

  
Charles Green, Ph.D.  
Laboratory Director

SM/CG:mlh



# FGL ENVIRONMENTAL

## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-4

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: BCPR 11038-4  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTL</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	170	10,000	5
Cadmium	0.5	100	2
Chromium (Total)	23	2,500	5
Copper	23	2,500	10
Lead	19	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.8	-	-

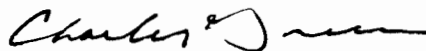
ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

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Inorganic Laboratory Manager



Charles Green, Ph.D.  
Laboratory Director

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-5

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: BCPR 5729-4  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

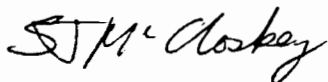
### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTLIC</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	97	10,000	5
Cadmium	ND	100	2
Chromium (Total)	11	2,500	5
Copper	47	1,500	10
Lead	18	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.7	-	-

ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

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Inorganic Laboratory Manager



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Laboratory Director

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-6

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: BCPR 3219-4  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTLIC</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	121	10,000	5
Cadmium	ND	100	2
Chromium (Total)	16	2,500	5
Copper	95	2,500	10
Lead	58	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	2	3	0.4
pH	7.6	-	-

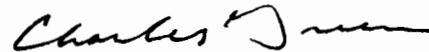
ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-1

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: EFA 6633-5  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTLIC</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	ND	500	2
Barium	56	10,000	5
Cadmium	ND	100	2
Chromium (Total)	16	2,500	5
Lead	21	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.2	-	-

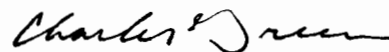
ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-7

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: BA 6833-8  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTL</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	40	10,000	5
Cadmium	ND	100	2
Chromium (Total)	10	2,500	5
Lead	5	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.7	-	-

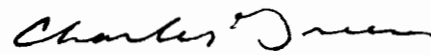
ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-9

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: BA 4132-8  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTL</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	40	10,000	5
Cadmium	ND	100	2
Chromium (Total)	10	2,500	5
Lead	5	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.7	-	-

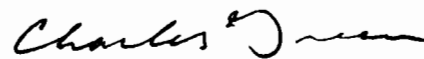
ND = Not detected at or above the  
concentration of the detection limit.

mg/kg = ppm

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## ANALYTICAL CHEMISTS

August 28, 1989  
Lab No. 19580-8

Bermite Division of Whittaker  
22116 West Soledad Canyon Road  
Saugus, California 19360

Sample Description: BA 6125-7  
Sampled by: Chris Thompson, Wenck  
Date Sampled: July 28, 1989  
Date Received: July 28, 1989

### HAZARDOUS WASTE CHARACTERIZATION (SOIL/ASH) REPORT OF ANALYSIS

<u>Parameters</u>	<u>Test Results</u> <u>mg/kg</u>	<u>TTL</u> <u>mg/kg</u>	<u>Detection</u> <u>Limit</u> <u>mg/kg</u>
Arsenic	-	500	2
Barium	300	10,000	5
Cadmium	ND	100	2
Chromium (Total)	13	2,500	5
Lead	6	1,000	5
Mercury	ND	20	0.2
Selenium	ND	100	1
Silver	ND	3	0.4
pH	7.6	-	-

ND = Not detected at or above the  
concentration of the detection limit.

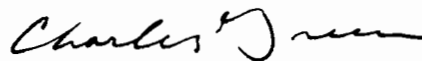
mg/kg = ppm

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Inorganic Laboratory Manager

SM/CG:mlh



Charles Green, Ph.D.  
Laboratory Director

ANAL. RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 2

File = BACKGSOIL

## BACKGROUND AREA METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE DEPTH	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Copper	Flouride	Lead	Magnesium	Mercury	Nickel	Selenium	Silver	Thallium
BGA-2323-1	0.0-0.5'	ND	4.0	50	ND	ND	ND	3100	ND	ND	ND	4.0	1400	ND	ND	ND	ND	ND
BGA-2323-2	0.5-1.0'	ND	3.0	ND	ND	ND	ND	3100	ND	ND	340	ND	1100	ND	ND	ND	ND	ND
BGA-2323-3	1.0-2.0'	ND	5.0	76	ND	7.0	ND	3100	ND	ND	ND	ND	3300	ND	20	ND	ND	ND
BGA-2323-4	2.0-3.0'	ND	ND	ND	ND	ND	ND	1500	ND	ND	ND	ND	960	ND	ND	ND	ND	ND
BGA-2323-5	3.0-4.0'	ND	4.0	ND	ND	ND	ND	1800	ND	ND	170	ND	1200	ND	ND	ND	ND	ND
BGA-2323-6	4.0-5.0'	ND	ND	ND	ND	ND	ND	1600	ND	ND	180	ND	1200	ND	ND	ND	ND	ND
BGA-2822-1	0.0-0.5'	ND	5.0	53	ND	6.0	ND	6200	ND	ND	420	4.0	1700	ND	ND	ND	ND	ND
BGA-2822-2	0.5-1.0'	ND	4.0	ND	ND	ND	ND	4300	ND	ND	180	12	1400	ND	ND	ND	ND	ND
BGA-2822-3	1.0-2.0'	ND	4.0	ND	ND	ND	ND	2200	ND	ND	130	ND	1700	ND	ND	ND	ND	ND
BGA-2822-4	2.0-3.0'	ND	ND	ND	ND	ND	ND	2100	ND	ND	160	ND	1100	ND	ND	ND	ND	ND
BGA-2822-5	3.0-4.0'	ND	5.0	ND	ND	ND	ND	1700	ND	ND	160	ND	1300	ND	ND	ND	ND	ND
BGA-2822-6	4.0-5.0'	ND	6.0	ND	ND	ND	ND	2000	ND	ND	110	ND	1600	ND	ND	ND	ND	ND
BGA-0115-1	0.0-0.5'	ND	5.0	52	ND	6.0	ND	4500	ND	23	390	4.0	1500	ND	ND	ND	ND	ND
BGA-0115-2	0.5-1.0'	ND	4.0	64	ND	7.4	ND	5700	ND	ND	180	4.0	1900	ND	ND	ND	ND	ND
BGA-0115-3	1.0-2.0'	ND	4.0	ND	ND	8.2	ND	5300	ND	14	380	4.0	2100	ND	ND	ND	ND	ND
BGA-0115-4	2.0-3.0'	ND	5.0	56	ND	9.0	ND	3400	ND	ND	ND	4.0	2300	ND	ND	ND	ND	ND
BGA-0115-5	3.0-4.0'	ND	4.0	ND	ND	ND	ND	2100	ND	ND	160	4.0	1100	ND	ND	ND	ND	ND
BGA-0115-6	4.0-5.0'	ND	6.0	ND	ND	ND	ND	1800	ND	ND	120	ND	1200	ND	ND	ND	ND	ND
BGA-1223-1	0.0-0.5'	ND	5.0	ND	ND	6.0	ND	3600	ND	ND	ND	ND	1600	ND	ND	ND	ND	ND
BGA-1223-2	0.5-1.0'	ND	6.0	ND	ND	6.0	ND	2100	ND	ND	270	ND	1400	ND	ND	ND	ND	ND
BGA-1223-3	1.0-2.0'	ND	6.0	ND	ND	ND	ND	1600	ND	ND	ND	ND	1500	ND	ND	ND	ND	ND
BGA-1223-4	2.0-3.0'	ND	5.0	ND	ND	ND	ND	1500	ND	ND	260	ND	1200	ND	ND	ND	ND	ND
BGA-1223-5	3.0-4.0'	ND	5.0	ND	ND	ND	ND	1900	ND	ND	ND	ND	1400	ND	ND	ND	ND	ND
BGA-1223-6	4.0-5.0'	ND	6.0	ND	ND	ND	ND	2000	ND	ND	ND	ND	1700	ND	ND	ND	ND	ND
Detection Limit		10	3.0	50	0.50	5.0	0.50	1000	50	10	100	3.0	500	0.10	10	0.50	3.0	5.0
Average Concentration		10	4.6	52	0.50	5.7	0.50	2925	50	11	184	3.7	1536	0.10	10	0.50	3.0	5.0
Upper Confidence Limit		10	4.9	54	0.50	6.0	0.50	3445	50	12	220	4.3	1710	0.10	11	0.50	3.0	5.0
Lower Confidence Limit		10	4.2	50	0.50	5.3	0.50	2405	50	10	148	3.0	1361	0.10	9.7	0.50	3.0	5.0
Standard Deviation		0.0	1.0	5.9	0.00	1.1	0.00	1487	0	2.7	103	1.8	499	0.00	2.0	0.00	0.0	0.0
Variance		0.0	1.0	35	0.00	1.3	0.00	2210652	0	7.5	10651	3.4	248730	0.00	4.2	0.00	0.0	0.0
Coefficient of Variation		0.0	22	11	0.00	20	0.00	51	0	26	56	50	32	0.00	20	0.00	0.0	0.0
Maximum Value		ND	6.0	76	ND	9.0	ND	6200	50	23	420	12	3300	ND	20	ND	ND	ND
Total Number of Samples		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24

## NOTE:

- 1) All No Detection Values (ND) Have Been Given A Value  
Equal To The Detection Limit For Purposes Of Calculation  
2) t = 1.714 in calculation of confidence limits



ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 6

File = BA01

## BURN AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
BA-10737-1	0.0-0.5'	ND	73	ND	14	8.1	ND	ND	ND
BA-10737-2	0.5-1.0'	ND	75	ND	14	14	ND	ND	ND
BA-10737-3	1.5-2.0'	ND	68	ND	13	27	ND	ND	0.80
BA-10737-4	2.5-3.0'	ND	78	ND	15	12	ND	ND	ND
BA-10737-5	3.5-4.0'	2.0	65	ND	14	22	ND	ND	ND
BA-10737-6	4.5-5.0'	ND	55	ND	10	17	ND	ND	ND
BA-10737-7	5.5-6.0'	ND	69	ND	12	15	ND	ND	0.41
BA-10737-8	6.5-7.0'	ND	63	ND	14	16	ND	ND	ND
BA-10737-9	7.5-8.0'	ND	204	ND	22	8.7	ND	ND	ND
BA-10737-10	8.5-9.0'	ND	28	ND	20	ND	ND	ND	ND
BA-6833-1	0.0-0.5'	ND	89	ND	17	22	ND	ND	ND
BA-6833-2	0.5-1.0'	2.2	60	ND	15	17	ND	ND	ND
BA-6833-3	1.5-2.0'	2.0	84	ND	21	35	ND	ND	0.44
BA-6833-4	2.5-3.0'	ND	94	ND	18	60	ND	ND	1.3
BA-6833-5	3.5-4.0'	2.1	71	ND	14	7.1	ND	ND	ND
BA-6833-6	4.5-5.0'	2.7	101	ND	17	52	ND	ND	7.4
BA-6833-7	5.5-6.0'	ND	168	ND	34	46	ND	ND	ND
BA-6833-8	6.5-7.0'	ND	158	2.3	38	50	ND	ND	0.77
BA-6833-9	7.5-8.0'	ND	ND	ND	7	ND	ND	ND	ND
BA-6833-10	8.5-9.0'	ND	54	2.7	12	ND	ND	ND	ND
BA-6125-1	0.0-0.5'	2.1	39	ND	13	ND	ND	ND	0.44
BA-6125-2	0.5-1.0'	ND	64	ND	16	59	ND	ND	1.4
BA-6125-3	1.5-2.0'	5.0	72	ND	ND	18	ND	ND	ND
BA-6125-4	2.5-3.0'	ND	28	ND	11	18	ND	ND	ND
BA-6125-5	3.5-4.0'	2.4	39	2.8	24	170	ND	ND	2.5
BA-6125-6	4.5-5.0'	ND	45	ND	14	27	ND	ND	ND
BA-6125-7	5.5-6.0'	ND	2250	ND	666	ND	ND	ND	ND
BA-6125-8	6.5-7.0'								
BA-6125-9	7.5-8.0'	2.1	304	4.9	15	ND	ND	ND	ND
BA-6125-10	8.5-9.0'	ND	60	ND	11	ND	ND	ND	ND
BA-2231-1	0.0-0.5'	2.6	69	ND	14	ND	ND	ND	0.43
BA-2231-2	0.5-1.0'	2.9	51	ND	11	ND	ND	ND	ND
BA-2231-3	1.5-2.0'	2.4	215	12.7	64	263	ND	ND	5.7
BA-2231-4	2.5-3.0'	ND	47	3.0	8	22	ND	ND	0.86
BA-2231-5	3.5-4.0'	4.0	259	ND	44	57	ND	ND	0.88
BA-2231-6	4.5-5.0'	ND	51	ND	11	ND	ND	ND	ND
BA-2231-7	5.5-6.0'	ND	41	ND	13	ND	ND	ND	ND
BA-2231-8	6.5-7.0'	ND	126	ND	16	ND	ND	ND	ND
BA-2231-9	7.5-8.0'	ND	48	ND	11	ND	ND	ND	0.40
BA-2231-10	8.5-9.0'	ND	34	ND	14	ND	ND	ND	ND

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 6

File = BAD1

## BURN AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
BA-4132-1	0.0-0.5'								
BA-4132-2	0.5-1.0'	ND	50	9.5	19	66	ND	ND	ND
BA-4132-3	1.5-2.0'	ND	75	ND	10	ND	ND	ND	ND
BA-4132-4	2.5-3.0'	2.0	43	ND	8	ND	ND	ND	0.43
BA-4132-5	3.5-4.0'	ND	45	ND	5	ND	ND	ND	ND
BA-4132-6	4.5-5.0'	2.0	221	ND	8	ND	ND	ND	ND
BA-4132-7	5.5-6.0'	2.1	306	ND	10	ND	ND	ND	ND
BA-4132-8	6.5-7.0'	ND	256	ND	7	8.7	ND	ND	0.43
BA-4132-9	7.5-8.0'	ND	31	ND	ND	ND	ND	ND	ND
BA-4132-10	8.5-9.0'	ND	32	ND	ND	ND	ND	ND	ND
BA-5828-1	0.0-0.5'	ND	56	ND	15	ND	ND	ND	ND
BA-5828-2	0.5-1.0'	ND	55	ND	13	ND	ND	ND	0.42
BA-5828-3	1.5-2.0'	ND	49	ND	10	13	ND	ND	ND
BA-5828-4	2.5-3.0'	ND	52	ND	10	13	ND	ND	0.86
BA-5828-5	3.5-4.0'	ND	41	ND	9	ND	ND	ND	ND
BA-5828-6	4.5-5.0'	ND	680	ND	155	7.6	ND	ND	ND
BA-5828-7	5.5-6.0'	ND	410	ND	15	ND	ND	ND	ND
BA-5828-8	6.5-7.0'	ND	38	ND	9	ND	ND	ND	ND
BA-5828-9	7.5-8.0'	ND	39	ND	8	ND	ND	ND	ND
BA-5828-10	8.5-9.0'	ND	42	ND	10	ND	ND	ND	ND
BA-10615-1	0.0-0.5'	ND	55	ND	11	12	ND	ND	ND
BA-10615-2	0.5-1.0'	ND	65	ND	8	22	ND	ND	1.2
BA-10615-3	1.5-2.0'	ND	123	ND	24	75	ND	ND	2.3
BA-10615-4	2.5-3.0'	ND	77	ND	15	33	ND	ND	0.40
BA-10615-5	3.5-4.0'	ND	69	ND	13	17	ND	ND	ND
BA-10615-6	4.5-5.0'								
BA-10615-7	5.5-6.0'	2.6	37	ND	12	41	ND	ND	ND
BA-10615-8	6.5-7.0'								
BA-10615-9	7.5-8.0'	ND	78	ND	17	23	ND	ND	ND
BA-10615-10	8.5-9.0'	ND	57	ND	11	ND	ND	ND	ND
Detection Limit		2.0	5	*0.50	5	5.0	0.20	1.0	*3.0
Average Concentration		2.9	131	1.0	29	22	0.20	1.0	2.5
Upper Confidence Limit		2.9	189	1.4	46	31	0.20	1.0	2.8
Lower Confidence Limit		2.8	72	0.6	12	14	0.20	1.0	2.2

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 6

File = BAD1

## BURN AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Sample Standard Deviation		0.4	285	2.0	82	40	--	--	1.3
Sample Variance		0.2	81334	3.9	6769	1597	--	--	1.6
Coefficient of Variation		15.5	218	192	286	178	--	--	50
Maximum Value		5.0	2250	12.7	666	263	ND	ND	7.4
Total Number of Samples		66	66	66	66	66	66	66	66
Background Average		4.6	52	0.50	50	3.7	0.10	0.50	3.0
Background Variance		1.0	35	0.00	0	3.4	0.00	0.00	0.0
t*		-7.9	2.2	2.2	-2.1	3.8			-3.3
t'		1.7	1.7	1.7	1.7	1.7			1.7

## NOTE:

All No Detection (ND) Values have been given  
a value equal to the detection limit  
for purposes of calculation

Std Dev. and Var are based on n - 1

$t^* = (\text{sample avg.} - \text{background avg.}) / \sqrt{(\text{sample var.} / \# \text{ samples}) + \text{background var.} / \# \text{ samples}}$

If  $t^* > t'$  then sample avg.  $\neq$  background avg.

\* The detection limit from the background samples

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 7

File = BCPRD2

## BURN CAGE, PANS AND RAILS AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
BCPR-11038-1	0.0-0.5'	3.0	75	ND	ND	ND	8.0	ND	ND	ND
BCPR-11038-1	0.5-1.0'	3.0	70	ND	ND	10	8.0	ND	ND	ND
BCPR-11038-1	1.0-2.0'	ND	50	ND	ND	10	4.0	ND	ND	ND
BCPR-11038-1	2.0-3.0'	8.0	620	1.4	ND	28	82	ND	ND	ND
BCPR-11543-1	0.0-0.5'	4.0	65	0.50	ND	12	12	ND	ND	ND
BCPR-11543-2	0.5-1.0'	3.0	55	ND	ND	ND	4.0	ND	ND	ND
BCPR-11543-3	1.0-2.0'	5.0	60	0.60	ND	40	30	ND	ND	ND
BCPR-11543-4	2.0-3.0'	5.0	55	ND	ND	ND	4.0	ND	ND	ND
BCPR-10617-1	0.0-0.5'	4.0	55	ND	ND	10	8.0	ND	ND	ND
BCPR-10617-2	0.5-1.0'	ND	50	ND	ND	ND	8.0	ND	ND	ND
BCPR-10617-3	1.0-2.0'	3.0	ND	ND	ND	ND	4.0	ND	ND	ND
BCPR-10617-4	2.0-3.0'	4.0	ND	ND	ND	10	4.0	ND	ND	ND
BCPR-8113-1	0.0-0.5'	4.0	ND	ND	ND	10	8.0	ND	ND	ND
BCPR-8113-2	0.5-1.0'	4.0	75	ND	ND	ND	6.0	ND	ND	ND
BCPR-8113-3	1.0-2.0'	4.0	60	4.6	ND	20	14	ND	ND	ND
BCPR-8113-4	2.0-3.0'	6.0	ND	ND	ND	ND	4.0	ND	ND	ND
BCPR-6036-1	0.0-0.5'	5.0	80	1.0	ND	32	24	ND	ND	ND
BCPR-6036-2	0.5-1.0'	5.0	60	ND	ND	10	6.0	ND	ND	ND
BCPR-6036-3	1.0-2.0'	4.0	65	1.0	ND	22	18	ND	ND	ND
BCPR-6036-4	2.0-3.0'	5.0	70	ND	ND	ND	6.0	ND	ND	ND
BCPR-5729-1	0.0-0.5'	7.0	90	0.50	ND	14	10	ND	ND	ND
BCPR-5729-2	0.5-1.0'	4.0	65	ND	ND	12	8.0	ND	ND	ND
BCPR-5729-3	1.0-2.0'	4.0	70	0.80	ND	24	26	ND	ND	ND
BCPR-5729-4	2.0-3.0'	5.0	500	1.0	ND	42	110	ND	ND	ND
BCPR-3219-1	0.0-0.5'	6.0	70	0.70	ND	38	42	ND	ND	ND
BCPR-3219-2	0.5-1.0'	6.0	65	1.0	ND	42	26	ND	ND	ND
BCPR-3219-3	1.0-2.0'	6.0	80	1.2	ND	76	54	ND	ND	ND
BCPR-3219-4	2.0-3.0'	7.0	100	1.2	ND	82	62	ND	ND	ND
BCPR-2138-1	0.0-0.5'	5.0	65	0.50	ND	14	14	ND	ND	ND
BCPR-2138-2	0.5-1.0'	5.0	70	ND	ND	10	10	ND	ND	ND
BCPR-2138-3	1.0-2.0'	8.0	90	1.0	ND	68	40	ND	ND	ND
BCPR-2138-4	2.0-3.0'									

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 7

File = BCPRD2

## BURN CASE, PANS AND RAILS AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
BCPR-2416-1	0.0-0.5'	6.0	55	ND	ND	12	10	ND	ND	ND
BCPR-2416-2	0.5-1.0'	6.0	50	ND	ND	ND	54	ND	ND	ND
BCPR-2416-3	1.0-2.0'	6.0	60	0.80	ND	68	28	ND	ND	ND
BCPR-2416-4	2.0-3.0'	7.0	50	ND	ND	10	6.0	ND	ND	ND
BCPR-3103-1	0.0-0.5'	5.0	ND	ND	ND	ND	4.0	ND	ND	ND
BCPR-3103-2	0.5-1.0'	6.0	ND	ND	ND	ND	4.0	ND	ND	ND
BCPR-3103-3	1.0-2.0'	9.0	75	ND	ND	12	4.0	ND	ND	ND
BCPR-3103-4	2.0-3.0'	7.0	60	ND	ND	10	8.0	ND	ND	ND
BCPR-1706-1	0.0-0.5'	4.0	95	ND	ND	19	7.0	ND	ND	ND
BCPR-1706-2	0.5-1.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
BCPR-1706-3	1.0-2.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
BCPR-1706-4	2.0-3.0'	ND	70	ND	ND	12	14	ND	ND	ND
BCPR-0925-1	0.0-0.5'	3.0	100	ND	ND	10	6	ND	ND	ND
BCPR-0925-2	0.5-1.0'	4.0	60	6.0	ND	18	16	ND	ND	ND
BCPR-0925-3	1.0-2.0'	4.0	60	ND	ND	14	10	ND	ND	ND
BCPR-0925-4	2.0-3.0'	4.0	85	ND	ND	10	22	ND	ND	ND
Detection Limit		3.0	50	0.50	50	10	4.0	0.10	0.50	3.0
Average Concentration		4.9	91	0.83	50	20	18	0.10	0.50	3.0
Upper Confidence Limit		5.2	116	1.1	50	25	24	0.10	0.50	3.0
Lower Confidence Limit		4.5	65	0.58	50	16	13	0.10	0.50	3.0
Sample Standard Deviation		1.5	106	0.99	--	19	22	--	--	--
Sample Variance		2.4	1130	0.99	--	355	491	--	--	--
Coefficient of Variation		32	117	120	--	92	120	--	--	--
Maximum Value		9.0	620	6.0	ND	82	110	ND	ND	ND
Total Number of Samples		47	47	47	47	47	47	47	47	47

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 7

File = BCPR02

## BURN CAGE, PANS AND RAILS AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
Background Average		4.6	52	0.50	50	11	3.7	0.10	0.50	3.0
Background Variance		1.0	35	0.00	0	7.5	3.4	0.00	0.00	0.0
t*		0.9	2.5	2.2		3.5	4.5			
t'		1.7	1.7	1.7		1.7	1.7			

## NOTE:

All No Detection (ND) Values have been given  
a value equal to the detection limit  
for purposes of calculation

Std Dev. and Var are based on n - 1

$$t^* = (\text{sample avg.} - \text{background avg.}) / \sqrt{(\text{sample var.} / \# \text{ samples}) + \text{background var.} / \# \text{ samples}}$$

.if  $t^* > t'$  then sample avg.  $\neq$  background avg.

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE 8

File = EFAD2

## EAST FOFK DETONATION AREA - METAL CONCENTRATIONS

All Values Are mg/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
EFA-6633-1	0.0-0.5'	5.0	ND	0.80	ND	ND	6.0	ND	ND	ND
EFA-6633-2	0.5-1.0'	5.0	ND	4.0	ND	ND	20	ND	ND	ND
EFA-6633-3	1.0-2.0'	10	ND	ND	ND	ND	58	ND	ND	ND
EFA-6633-4	2.0-3.0'	5.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-6633-5	3.0-4.0'	5.0	ND	ND	ND	ND	110	ND	ND	ND
EFA-6633-6	4.0-5.0'	8.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-6633-7	5.0-6.0'	7.0	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-6633-8	6.0-7.0'	7.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-6633-9	7.0-8.0'	9.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-1511-1	0.0-0.5'	5.0	ND	4.2	ND	ND	14	ND	ND	ND
EFA-1511-2	0.5-1.0'	4.0	ND	7.2	ND	ND	10	ND	ND	ND
EFA-1511-3	1.0-2.0'	5.0	ND	4.4	ND	ND	10	ND	ND	ND
EFA-1511-4	2.0-3.0'	5.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-1511-5	3.0-4.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-1511-6	4.0-5.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-1511-7	5.0-6.0'	4.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-1511-8	6.0-7.0'	6.0	ND	ND	ND	ND	8.0	ND	ND	ND
EFA-1511-9	7.0-8.0'	6.0	ND	ND	ND	12	6.0	ND	ND	ND
EFA-5714-1	0.0-0.5'									
EFA-5714-2	0.5-1.0'	7.0	ND	4.0	ND	ND	22	ND	ND	ND
EFA-5714-3	1.0-2.0'	5.0	ND	4.0	ND	ND	22	ND	ND	ND
EFA-5714-4	2.0-3.0'	ND	ND	2.0	ND	ND	8.0	ND	ND	ND
EFA-5714-5	3.0-4.0'	3.0	ND	0.50	ND	ND	6.0	ND	ND	ND
EFA-5714-6	4.0-5.0'	3.0	ND	0.50	ND	ND	6.0	ND	ND	ND
EFA-5714-7	5.0-6.0'	5.0	ND	0.50	ND	ND	6.0	ND	ND	ND
EFA-5714-8	6.0-7.0'	6.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-5714-9	7.0-8.0'	8.0	50	ND	ND	ND	6.0	ND	ND	ND
EFA-3709-1	0.0-0.5'	4.0	ND	6.0	ND	ND	14	ND	ND	ND
EFA-3709-2	0.5-1.0'	3.0	ND	4.0	ND	ND	12	ND	ND	ND
EFA-3709-3	1.0-2.0'	4.0	ND	6.0	ND	ND	6.0	ND	ND	ND
EFA-3709-4	2.0-3.0'	8.0	60	ND	ND	ND	6.0	ND	ND	ND
EFA-3709-5	3.0-4.0'	6.0	ND	ND	ND		4.0	ND	ND	ND
EFA-3709-6	4.0-5.0'	6.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-3709-7	5.0-6.0'	8.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-3709-8	6.0-7.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-3709-9	7.0-8.0'	10	78	ND	ND	ND	8.0	ND	ND	ND

ANALYSIS RESULTS FROM  
SGIL SAMPLING AT  
RCRA UNITS

TABLE 8

File = EFAD2

## EAST FOFK DETONATION AREA - METAL CONCENTRATIONS

All Values Are ug/kg (ppm)

SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
EFA-2220-1	0.0-0.5'	5.0	ND	8.0	ND	ND	20	ND	ND	ND
EFA-2220-2	0.5-1.0'	3.0	ND	6.0	ND	ND	16	ND	ND	ND
EFA-2220-3	1.0-2.0'	ND	ND	26	ND	ND	8.0	ND	ND	ND
EFA-2220-4	2.0-3.0'	3.0	ND	0.80	ND	ND	4.0	ND	ND	ND
EFA-2220-5	3.0-4.0'	4.0	ND	72	ND	ND	6.0	ND	ND	ND
EFA-2220-6	4.0-5.0'	4.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-2220-7	5.0-6.0'	ND	ND	ND	ND	ND	26	ND	ND	ND
EFA-2220-8	6.0-7.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-2220-9	7.0-8.0'	4.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-0240-1	0.0-0.5'	4.0	ND	2.2	ND	ND	12	ND	ND	ND
EFA-6633-2	0.5-1.0'	4.0	ND	ND	ND	ND	6.0	ND	ND	ND
EFA-6633-3	1.0-2.0'	5.0	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-6633-4	2.0-3.0'	ND	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-6633-5	3.0-4.0'	3.0	ND	ND	ND	ND	4.0	ND	ND	ND
EFA-6633-6	4.0-5.0'	3.0	ND	ND	ND	10	ND	ND	ND	ND
EFA-6633-7	5.0-6.0'	ND	ND	ND	ND	ND	ND	ND	ND	ND
EFA-6633-8	6.0-7.0'	4.0	ND	ND	ND	16	ND	ND	ND	ND
EFA-6633-9	7.0-8.0'	5.0	ND	ND	ND	ND	4.0	ND	ND	ND
Detection Limit		3.0	50	0.50	50	10	4.0	0.10	0.50	3.0
Sample Average Concentration		4.9	51	3.4	50	10	11	0.10	0.50	3.0
Upper Confidence Limit		5.3	52	5.8	50	10	15	0.10	0.50	3.0
Lower Confidence Limit		4.5	50	0.99	50	10.0	7.1	0.10	0.50	3.0
Sample Standard Deviation		1.9	4.1	10	--	0.87	16	--	--	--
Sample Variance		3.7	16	108	--	0.76	269	--	--	--
Coefficient of Variation		39	8.0	366	--	8.6	151	--	--	--
Maximum Value		10	78	72	ND	16	110	ND	ND	ND
Total Number of Samples		53	53	53	53	52	53	53	53	53



17-Mar-88

WENCK ASSOCIATES, INC.

ANALYSIS RESULTS FROM  
SOIL SAMPLING AT  
RCRA UNITS

TABLE B

File = EFAD2

EAST FOFK DETONATION AREA - METAL CONCENTRATIONS

		All Values Are mg/kg (ppm)								
SAMPLE I.D.	SAMPLE Depth	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
Background Average		4.6	52	0.50	50	11	3.7	0.10	0.50	3.0
Background Variance		1.0	35	0.00	0	7.5	3.4	0.00	0.00	0.0
t*		1.0	-1.1	2.0		-1.0	3.2			
t'		1.7	1.7	1.7		1.7	1.7			

NOTE:

All No Detection (ND) Values have been given  
a value equal to the detection limit  
for purposes of calculation

Std Dev. and Var are based on n - 1

$$* = (\text{sample avg.} - \text{background avg.}) / \sqrt{((\text{sample var.} / \# \text{ samples}) + \text{background var.} / \# \text{ samples})}$$

If  $t^* > t$  then sample avg.  $\neq$  background avg.

## **APPENDIX B**

### **Bio-Assay Analyses Results**

# FGL ENVIRONMENTAL

## ANALYTICAL CHEMISTS

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September 25, 1989

Christopher F. Thompson, P.E.  
Wenk Associates, Inc.  
15500 Wayzata Blvd., Suite 832  
Wayzata, MN 55391

Dear Chris:

The data obtained for the fish bioassays (FGL Lab # 19580) show a higher level of mortality than usually observed. This can be explained by the condition of the fish when they arrived at the laboratory prior to the bioassay. Although the fish were shipped for overnight delivery, an error in shipping delayed delivery for 2 days. The stress created by this was probably the major factor in the higher mortality level. It is also worth noting that there does not appear to be a correlation between Final % Mortality and Test Concentration (as an example, the Control for Lab # 19580-9 showed a Final % Mortality of 30 percent).

If you have any questions, please call or write.

Yours Truly,  
FGL ENVIRONMENTAL



Charles Green  
Laboratory Director

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-9

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, BA-4132-8

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/29/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l ATka- Hard- linity ness	
Control	7.4	9.0	19	2	7.1	9.0	19	2	7.2	8.6	19	2	7.2	8.9	19	0	7.2	8.7	19	30	36	43
18	7.2	9.0	19	0	7.0	8.9	19	0	7.1	8.8	19	0	7.2	8.9	19	0	7.2	8.9	19	0	--	--
32	7.1	9.0	19	0	7.1	8.6	19	1	7.1	8.5	19	1	7.2	8.8	19	2	7.2	8.9	19	20	--	--
56	7.1	9.1	19	1	7.1	8.7	19	0	7.1	8.4	19	0	7.2	8.8	19	0	7.2	8.9	19	5	--	--
75	7.2	9.1	19	0	7.1	8.7	19	1	7.1	8.5	19	0	7.2	9.0	19	1	7.2	8.8	19	10	--	--
100	7.1	9.0	19	1	7.1	8.9	19	0	7.1	8.6	19	1	7.2	8.8	19	0	7.2	8.7	19	10	31	44

Species: Fathead Minnow Ave. Length: 2.6 cm Max. Length: 2.8 cm Min. Length: 2.5 cm Avg. Weight: 1.0 g Max. Weight: 1.2 g Min. Weight: 0.8 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 17 days at 19 °C. Percent dead in acclimatization tank 5 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 90 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles D. Smith

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-8

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, BA-6125-7

Sampled by: Chris Thompson      Date Sampled: 7/28/89      Date Received: 7/28/89      Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO3, mg/l Alka- Hard- linity ness	
Control	7.4	9.4	19	0	7.6	9.4	19	0	7.7	9.4	19	0	7.8	9.3	19	0	7.6	9.0	19	0	39	55
18	7.4	9.8	19	0	7.6	9.3	19	0	7.7	9.2	19	0	7.8	9.1	19	0	7.7	9.2	19	0	--	--
32	7.3	9.5	19	0	7.6	9.3	19	0	7.6	9.2	19	0	7.7	9.1	19	0	7.6	9.1	19	0	--	--
56	7.3	9.6	19	0	7.6	9.3	19	0	7.7	9.1	19	0	7.7	9.0	19	0	7.6	9.2	19	0	--	--
75	7.3	9.5	19	0	7.6	9.3	19	0	7.6	9.2	19	0	7.7	9.1	19	0	7.6	9.2	19	0	--	--
100	7.3	9.7	19	0	7.6	9.2	19	0	7.6	9.1	19	0	7.7	9.3	19	0	7.6	9.4	19	0	36	61

Species: Fathead Minnow Ave. Length: 2.6 cm Max. Length: 2.8 cm Min. Length: 2.5 cm Avg. Weight: 1.0 g Max. Weight: 1.2 g Min. Weight: 0.8 g  
Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous  
Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals  
LC50 Greater than 500 mg/L % Survival undiluted waste 100 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles Drennon

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-7

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, BA-6833-8

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial				24 hrs.				48 hrs.				72 hrs.				96 hrs.				FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C	No. Dead	pH	DO mg/l	Temp. °C	No. Dead	pH	DO mg/l	Temp. °C	No. Dead	pH	DO mg/l	Temp. °C	No. Dead	pH	DO mg/l	Temp. °C	No. Dead		CaCO <sub>3</sub> , mg/l	Alka- Hard- linity ness
Control	7.4	9.5	19	0	7.6	9.5	19	0	7.7	9.6	19	0	7.7	9.4	19	0	7.6	9.3	19	0	0	38	49
18	7.3	9.6	19	0	7.5	9.0	19	0	7.6	9.5	19	0	7.7	9.3	19	0	7.6	9.2	19	0	0	--	--
32	7.3	9.6	19	0	7.5	9.1	19	0	7.6	9.4	19	0	7.7	9.2	19	0	7.6	9.2	19	0	0	--	--
56	7.3	9.6	19	0	7.6	9.2	19	0	7.6	9.3	19	0	7.7	9.2	19	0	7.6	9.2	19	0	0	--	--
75	7.3	9.5	19	0	7.6	9.2	19	0	7.6	9.2	19	0	7.7	9.4	19	0	7.6	9.3	19	0	0	--	--
100	7.3	9.6	19	0	7.5	9.3	19	0	7.6	9.0	19	0	7.7	9.5	19	0	7.6	9.4	19	0	0	36	54

Species: Fathead Minnow Ave. Length: 2.7 cm Max. Length: 2.9 cm Min. Length: 2.6 cm Avg. Weight: 1.0 g Max. Weight: 1.1 g Min. Weight: 0.9 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 100 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles D...

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-6

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, BCPR-3219-4

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l Alka- Hard- linity ness	
Control	7.4	9.3	19	0	7.5	9.2	19	0	7.7	9.1	19	0	7.8	9.1	19	0	7.6	9.0	19	0	35	48
18	7.4	9.5	19	0	7.6	9.3	19	0	7.7	9.2	19	0	7.8	9.1	19	0	7.6	9.1	19	0	--	--
32	7.4	9.5	19	0	7.5	9.3	19	0	7.7	9.2	19	1	7.7	9.3	19	0	7.6	9.2	19	5	--	--
56	7.3	9.6	19	0	7.5	9.3	19	0	7.7	9.4	19	0	7.8	9.3	19	0	7.6	9.2	19	0	--	--
75	7.3	9.5	19	0	7.6	9.3	19	0	7.7	9.3	19	0	7.8	9.4	19	0	7.6	9.3	19	0	--	--
100	7.3	9.4	19	0	7.6	9.3	19	0	7.7	9.4	19	0	7.8	9.4	19	0	7.6	9.3	19	0	36	52

Species: Fathead Minnow Ave. Length: 2.6 cm Max. Length: 2.8 cm Min. Length: 2.5 cm Avg. Weight: 0.9 g Max. Weight: 1.0 g Min. Weight: 0.8 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 100 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles J. [Signature]

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-5

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, BCPR-5729-4

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l Alka- Hard- linity ness	
Control	7.5	8.9	19	0	7.6	9.1	19	0	8.0	9.1	19	0	7.8	9.2	19	0	7.7	9.2	19	0	40	52
18	7.4	9.3	19	0	7.6	9.0	19	0	7.8	9.1	19	0	7.8	9.3	19	0	7.7	9.2	19	0	--	--
32	7.4	9.4	19	0	7.6	9.2	19	0	7.8	9.2	19	0	7.8	9.3	19	0	7.6	9.2	19	0	--	--
56	7.5	9.4	19	0	7.6	9.3	19	0	7.8	9.3	19	0	7.8	9.3	19	2	7.6	9.4	19	10	--	--
75	7.4	9.4	19	0	7.6	9.4	19	0	7.7	9.3	19	0	7.8	9.4	19	0	7.6	9.5	19	0	--	--
100	7.4	9.5	19	0	7.6	9.3	19	0	7.7	9.4	19	0	7.8	9.4	19	0	7.6	9.5	19	0	42	67

Species: Fathead Minnow Ave. Length: 3.0 cm Max. Length: 3.2 cm Min. Length: 2.8 cm Avg. Weight: 1.1 g Max. Weight: 1.3 g Min. Weight: 0.9 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 100 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles J. [Signature]

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.



FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-3

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, EFA-3709-9

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l Alka- Hard- linity ness	
Control	7.1	9.2	19	0	7.5	8.8	19	0	7.5	8.8	19	0	7.6	8.9	19	0	7.5	6.2	19	0	35	65
18	7.1	9.3	19	0	7.5	8.9	19	0	7.5	8.9	19	0	7.6	8.7	19	0	7.5	8.6	19	0	--	--
32	7.1	9.2	19	0	7.4	9.2	19	0	7.5	9.1	19	0	7.5	8.8	19	0	7.5	8.7	19	0	--	--
56	7.0	9.0	19	0	7.4	8.5	19	0	7.5	9.1	19	0	7.5	8.6	19	0	7.5	8.8	19	0	--	--
75	7.0	9.0	19	0	7.5	8.8	19	1	7.5	8.8	19	0	7.5	8.6	19	2	7.5	8.7	19	15	--	--
100	7.0	9.3	19	0	7.5	8.9	19	0	7.5	9.0	19	0	7.5	8.7	19	1	7.6	9.0	19	5	36	104

Species: Fathead Minnow Ave. Length: 2.8 cm Max. Length: 2.5 cm Min. Length: 2.8 cm Avg. Weight: 1.0 g Max. Weight: 1.1 g Min. Weight: 0.9 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 95 Dilution Water Source Acclimation Water

Analyst Diana Sutton

Charles D. ...

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-4

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, BCPR-11038-4

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l Alka- Hard- linity ness	
Control	7.1	9.2	19	0	7.5	8.6	19	0	7.5	8.9	19	0	7.6	8.6	19	0	7.6	8.6	19	0	31	65
18	7.1	9.2	19	0	7.5	8.5	19	0	7.5	8.9	19	0	7.5	8.7	19	0	7.6	8.9	19	0	--	--
32	7.1	9.6	19	0	7.5	8.7	19	0	7.5	8.9	19	0	7.5	8.6	19	0	7.6	8.9	19	0	--	--
56	7.1	9.3	19	0	7.5	8.7	19	0	7.5	9.0	19	0	7.5	8.7	19	0	7.6	8.9	19	0	--	--
75	7.0	9.2	19	0	7.5	8.6	19	0	7.5	8.9	19	0	7.5	8.7	19	0	7.6	9.0	19	0	--	--
100	7.0	9.4	19	0	7.5	8.7	19	0	7.5	9.0	19	0	7.5	8.7	19	0	7.6	9.3	19	0	42	72

Species: Fathead Minnow Ave. Length: 2.8 cm Max. Length: 3.0 cm Min. Length: 2.6 cm Avg. Weight: 1.0 g Max. Weight: 1.2 g Min. Weight: 0.8 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 100 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles D...

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

Lab No. 19580-2

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, EFA-2220-5

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l Alka- Hard- linity ness	
Control	7.2	9.3	19	0	7.5	8.9	19	0	7.5	9.0	19	0	7.5	8.7	19	0	7.4	8.7	19	0	45	58
18	7.1	9.4	19	1	7.4	8.9	19	0	7.5	9.0	19	0	7.5	8.9	19	2	7.4	8.9	19	15	--	--
32	7.1	9.4	19	0	7.4	9.0	19	0	7.5	9.0	19	0	7.5	8.9	19	0	7.4	6.7	19	0	--	--
56	7.0	9.3	19	0	7.4	8.5	19	0	7.5	9.0	19	0	7.5	8.8	19	0	7.4	9.2	19	0	--	--
75	7.0	9.2	19	0	7.4	8.9	19	0	7.5	9.2	19	0	7.5	8.8	19	0	7.5	9.2	19	0	--	--
100	7.0	9.5	19	0	7.4	9.0	19	0	7.5	9.3	19	0	7.5	8.8	19	2	7.5	9.0	19	10	29	93

Species: Fathead Minnow Ave. Length: 2.8 cm Max. Length: 3.0 cm Min. Length: 2.6 cm Avg. Weight: 0.9 g Max. Weight: 1.0 g Min. Weight: 0.8 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 90 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles D. [Signature]

A waste sample is designated as hazardous (Section 4, Chapter 30, Article 11 of  
Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.

FGL ENVIRONMENTAL  
853 Corporation St. - P.O. Box 272  
Santa Paula, California 93060

96 HOUR STATIC BIOASSAY - TITLE 22 DEFINITIVE

RECEIVED BY  
WENCK ASSOCIATES INC.

SEP 5 1989

Lab No. 19580-1

Client: Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Sample Description: Project No. 85-01.4, EFA-6633-5

Sampled by: Chris Thompson Date Sampled: 7/28/89 Date Received: 7/28/89 Date Reported: 8/23/89

REPORT OF ANALYSIS

Test Con'c. mg/L	Initial			No. Dead	24 hrs.			No. Dead	48 hrs.			No. Dead	72 hrs.			No. Dead	96 hrs.			FINAL % Mortality	INITIAL	
	pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		pH	DO mg/l	Temp. °C		CaCO <sub>3</sub> , mg/l Alka- Hard- linity ness	
Control	7.2	9.2	19	0	7.4	8.5	19	0	7.5	8.7	19	0	7.6	8.6	19	0	7.5	7.4	19	0	31	54
18	7.1	9.0	19	0	7.4	8.6	19	1	7.4	8.8	19	0	7.4	8.5	19	0	7.3	7.8	19	5	--	--
32	7.1	9.2	19	1	7.4	8.7	19	0	7.4	8.7	19	2	7.4	8.6	19	3	7.3	7.4	19	30	--	--
56	7.1	9.1	19	1	7.4	8.6	19	1	7.4	8.5	19	0	7.5	8.7	19	0	7.3	7.9	19	10	--	--
75	7.1	9.2	19	1	7.4	8.4	19	0	7.4	8.8	19	0	7.5	8.8	19	0	7.3	6.9	19	5	--	--
100	7.1	9.2	19	0	7.4	8.5	19	0	7.4	9.0	19	0	7.5	8.6	19	0	7.3	7.7	19	0	36	76

Species: Fathead Minnow Ave. Length: 2.6 cm Max. Length: 2.8 cm Min. Length: 2.4 cm Avg. Weight: 0.8 g Max. Weight: 0.9 g Min. Weight: 0.7 g

Number of test animals per concentration: 20 Volume of test solution: 10 Liters Depth: 12.5 cm Type Aeration: Continuous

Acclimatization 10 days at 19 °C. Percent dead in acclimatization tank 3 Water Source Deionized + Minerals

LC50 Greater than 500 mg/L % Survival undiluted waste 100 Dilution Water Source Acclimation Water

Analyst Diana Sutton Charles D. [Signature]

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Title 22 of the California Administrative Code) if the LC50 is less than 500 mg/liter.